

Characterization of wind energy in Hydro-Québec power system



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Québec's Energy Context ...

- **Electrical demand growth**
 - + 1,2% per year (+ stronger growth in urban zones)
 - **± 100 TWh needed over next 30 ans (~20 000 MW)**
- **Regulatory Environment for electricity (Bill 116)**
 - Competitive bids issued by HQ-Réseaux (Distribution)
 - Portfolio Diversification (new power sources)
 - Quota for non-hydraulic power sources
- **Electricity market (Import/export)**
 - **Comparison of energy options**
 - **Cost: power and energy**
 - **Service of each option vs management of overall system**
 - **Distributed generation**
 - Low impact until 2010

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Value of wind power for Québec

■ LONG TERM SUPPLY STABILITY

Mitigation of hydraulic and climatological risk

- **Diversification** of resource portfolio: gas, wind
- **Lower variability** of natural inflows to the system

■ ENERGY COSTS STABILIZATION

- Wind industry growth=> **lower cost of kWh**
- **Large wind resource available** (~ hydraulic)
- « **Free Fuel** »

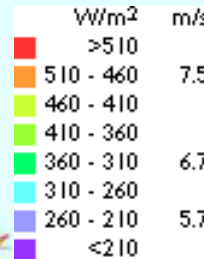
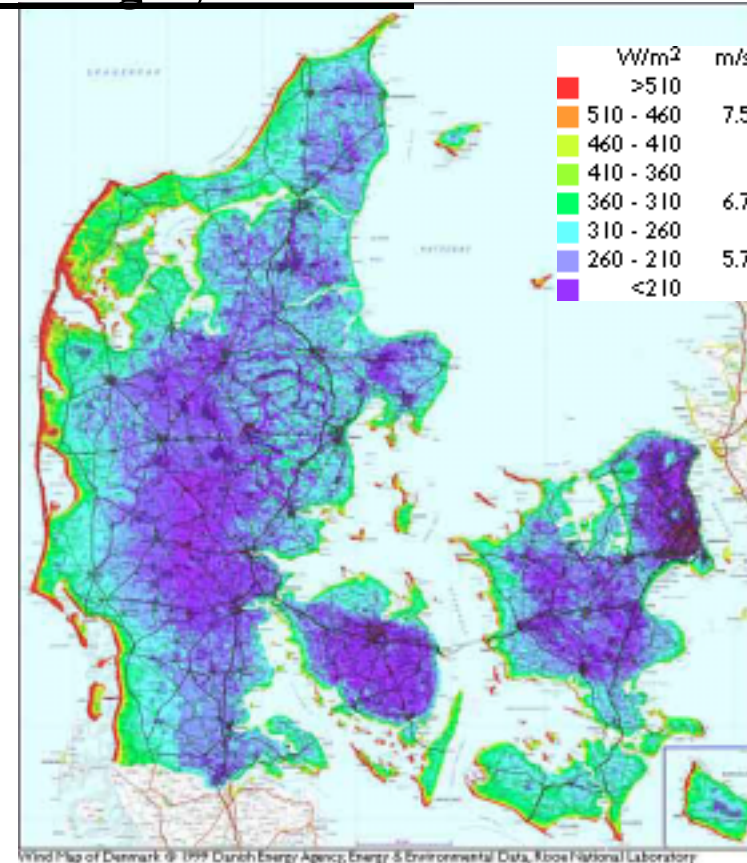
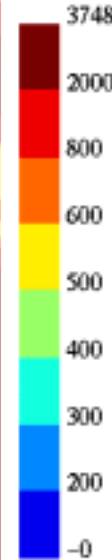
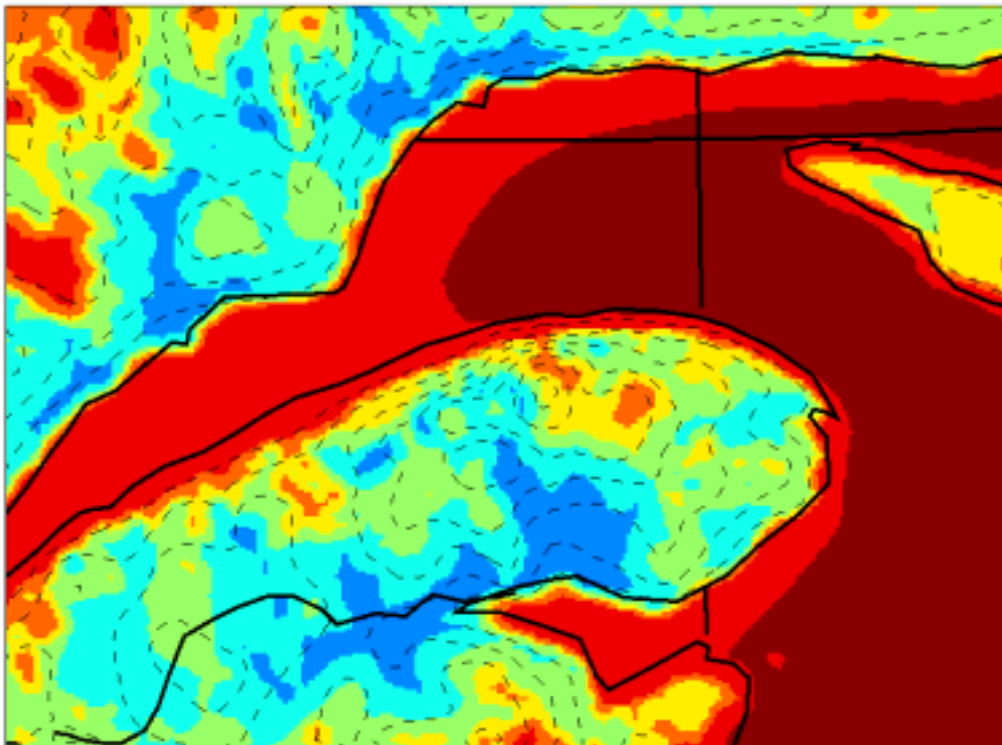
■ POSITIVE IMPACT ON RESERVOIR PRODUCTIVITY

- **Wind-Load Correlation** (electrical heating)
- **Natural Wind-Hydro Complementarity**

■ Export Opportunities

- **spot market, green marketing** brokers, local manufacturing?
- + Monetization of environmental value of wind vs fossil fuels
 - value of CO2 emissions reduction, public health bonus, etc

A Available Wind Power Density at 50 m height, in W/m²



Gaspésia Peninsula and North-Shore, Qc

Source: R. Benoit, W. Yu et D. Lemarquis, RPN, MSC- Environnement Canada,
 "Mesoscale mapping of the wind Energy Climate of Canada",
 Conférence de l'Association Canadienne d'énergie éolienne, 29-31 octobre 2001

Denmark

Source www.windpower.org

**For wind resource comparison purposes, each of the two maps (QC Gaspesia/North-Shore and Denmark) represent approximately 45 000 km².
 Québec wind resource is quality is clearly visible.**

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IREQ's role: Characterization of Wind Energy in Qc Electricity System ...

- Main grid (Project started may 2002):
Develop tools and methods to insure smooth integration of wind technology in HQ power system.

3 themes:

- **Management of Wind generation**
- **Wind penetration vs Grid stability**
- **Economic and financial analyses (scenarios)**

Resources(IREQ's unités d'expertises):

- Analyse et gestion de réseaux
- Laboratoire Simulation de réseaux
- Mécanique-Métallurgie et Civil
- Appareillage de réseaux
- INRS-Énergie

